Monetary Policy Transmission Mechanisms and Domestic Real Investment in Nigeria: A Time Series Study 1981-2015.

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ABSTRACT
This study examined the effects of monetary policy transmission mechanisms on the domestic real investment in Nigeria. Time series data were sourced from Central Bank of Nigeria statistical bulletin from 1981 to 2015. Domestic real investment was modeled as the function of percentage of credit to private sector to gross domestic product, naira exchange rate per US dollar, maximum lending rate, monetary policy rate, prime lending rate, net domestic credit, savings rate and Treasury bill rate. Granger causality test and Johansen co-integration test in the vector error correction model (VECM) setting were employed. Durbin Watson, β Coefficient, R-Square (R^2) and F-Statistics were used to determine the relationship between the dependent and independent variables as formulated in the regression models. The result proved that CPS/GDP, MLR, MPR, NDC and SR have positive relationship with Nigeria real domestic investment while EXR, PLR, and TBR have negative relationship with domestic real investment. The cointegration test proved the present of long run relationship between monetary policy variables and domestic real investment. The ADF test prove that the variables are stationary at first difference, the granger causality test proved both bi-directional, uni-directional and independent relationship running from the independent variables to the dependent variable and from the dependent variable to the independent variables. The error correction model proved that the speed of adjustment is adequate while the parsimonious error correction model proved that MPR and SR have positive relationship while EXR and PLR have negative relationship. From the regression summary, the study concludes that monetary policy transmission mechanism has significant relationship with Nigeria domestic real investment. We recommend that Interest rate management and reactions to domestic real investment must be factored into the management and formulation of monetary policy in Nigeria and institutional and policy barriers to investment should be removed. There is need to elimination barriers to effective transmission of monetary, expansionary monetary policy should be formulated that will reduce interest rate, encourage borrowings and savings. There is also need to revisit some of the policies that conflict with the monetary policy objectives to correspond with the modern financial system innovation that will enhance the free flow of investment into the Nigeria economy.

KEYWORDS: *Monetary policy transmission mechanism, Domestic Real Investment, Interest rate channel, credit channel, exchange rate channel, asset price channel.*

SECTION I: INTRODUCTION

The concept of money and its effect on the economy was a controversial issue among the mainstream economists such as the classical, Keynesians and the neoclassical economists. To the

classical economists, money is insignificant and does not matter. To the Keynesians, money have indirect effect on the economy through interest rate, while to the neo-classical economist, money is the only thing that matters in the economy (Ezirim, 2005). Investment is component of aggregate demand. It is the most volatile component of aggregate demand and fluctuation in its level is highly correlated with fluctuation in Gross National Product known as business cycle (Iyoha, 2004). Real investment can be private or public, while public investment is autonomous; the private investment is determined by monetary and macroeconomic variables in the economy. Unlike financial investment that is an avenue to increase wealth, real investment increases the productive capacity of the economy, create employment and expand production beyond national consumption, a prerequisite for economic growth, full employment, price stability and external balance. Domestic investment is a tool for measuring the level of Gross Domestic Product (Amer, Umer and Muhammad, 2014). Investment play key role in increasing capital formation and brings about long-run economic growth. Through the control of monetary policy targets such as the price of money (interest rate both short term and long term), the quantity of money and reserve money amongst others; monetary authorities directly and indirectly control the demand for money, money supply, or the availability of money and hence affect output and private sector investment (Tobias and Mambo, 2012).

Monetary policy refers to the policy of the monetary authority with regard to monetary (money) matters. It deals with the controls of financial institutions, active purchases and sales of paper assets to affect changes in money supply and maintenance of interest rate (Jhingan, 2005). The objective is to achieve set macroeconomic goals such as full employment, economic growth, price stability and external balance. It is an attempt to achieve the national economic goals of full employment without inflation, rapid economic growth and balance of payment equilibrium through the control of money supply and credit. The classical theory of monetary policy postulate that changes in money supply or other aggregates will work through some intermediate variables through which some effects are transmitted to the ultimate goals of price stability, output, employment and external balance (CBN, 2011). Monetary policy transmission mechanism refers to the various intermediate channels through which changes in the nominal money stock or short term interest rates affects the macroeconomic aggregates. In Nigeria, Central bank of Nigeria Act 1969 empowered CBN the monetary policy function under the supervision of Ministry of Finance.

The transmission mechanisms includes the interest rate channel which explain the relationship expansionary monetary policy such as reduction in long-term interest rates which in turn affects business investment, investment in residential housing and consumers expenditure on durable goods, the asset price channel opine that expansionary monetary policy leads to higher equity price which makes investment more attractive and raises aggregate demand, the exchange rate channel proved that an expansionary monetary policy lowers the domestic real interest rate and through the foreign interest parity condition brings about a real depreciation of the domestic currency, this results to higher net exports and stronger aggregate demand on the supply side, real depreciation that results from expansionary monetary policy raises the domestic prices of imported goods and contracts aggregate supply reducing output and increasing inflation. Changes in the exchange rate have two opposite effects on investment, when the domestic currency depreciates, the marginal profit of investing an additional unit of capital is likely to increase because there are higher revenue from both domestic and foreign sales. Yet this positive

effect is counterbalanced by the rising variable cost and higher price for imported capital. Exchange rate depreciation stimulates (dampens) investment because of the increasing cost of imported intermediate goods and the user cost of capital. Investment response to exchange rate differs among countries and different sectors of the economy (Tarek et al., 2005).

Various hypotheses have been formulated on the relationship between money and the economy. Morgan (1981) identified two causal relationships between private investment and monetary policy. McKinnon (1973) supports the supply leading argument by suggesting a complementary relationship between accumulations of money balances (financial assets) and physical capital accumulation in developing countries. Shaw (1973) also supporting the supply leading argument and basing his argument on inside money model, proposed that high interest rates are essential in attracting more saving(Onouorah, Shaib and Ehikioya, 2012). The inabilities for the classical economists to restore equilibrium during the great depression of 1930s remain one of the challenges facing the effectiveness of monetary policy in the developing countries like Nigeria. Empirical studies on monetary policy transmission mechanism have well been documented in literature. Significant proportion of the study focused on monetary policy transmission mechanism and economic growth using Gross Domestic Product as dependent variable (Ogbulu and Torrbira, 2012; Obafemi and Ifere, 2015; Ndekwu, 2013; Ishiroro, 2013). Only few studies of citable significance have dealt on the problem of monetary policy transmission mechanism and domestic real investment in Nigeria. From the above, this study intends to examine the effect of monetary policy on domestic investment in Nigeria. The rest part of this paper are as follows; section two discuses conceptual, theoretical and empirical studies on the effect of monetary policy on investment, section three discusses the methods adopted in the study, section four presents and analyze results while section five concludes and make recommendations from the findings .

SECTION II: LITERATURE REVIEW

Interest Rate Transmission Mechanisms

Interest rate transmission channel is the most conventional mechanism and at the same time, the one used in empirical studies to embody the joint effect of all the channels. It is the mechanism that underlies public intuition and media debates on the role played by monetary policy in modern economies. It combines the central bank's ability to affect a real variable (the interest rate) and the existence of inter-temporal substitution elasticity on the components of aggregate demand. In Nigeria financial market, the monetary authorities' control (direct or indirect) the interest rates of other instruments can be large, thereby aiding the transmission of their policy decisions. The market can also interpret current interest rate movements as a signal of future monetary policy actions, making longer term rates react consistently.

Investment-based Channels: Direct Interest-Rate Channels

The most traditional channel of monetary transmission that have been embedded in macroeconomic models involve the impact of interest rates on the cost of capital and hence on business and household investment spending (residential and consumer durables investment). Standard neoclassical models of investment demonstrate that the user cost of capital is a key determinant of the demand for capital, whether it is investment goods, residential housing or consumer durables. The user cost of capital (*uc*) can be written as:

$$u_c = p_c\left[(1-\tau)i - \pi_c^e + \delta\right] \qquad (1)$$

Where, p_c is the relative price of new capital, i is the nominal interest rate, π_c^e is the expected rate of price appreciation of the capital asset, and δ is the depreciation rate. The user cost formula also allows for the deductibility of the interest rate (which is particularly important in the United States where mortgage interest is deductable) by adjusting the nominal interest rate by the marginal tax rate τ . Regrouping terms, the user cost of capital can be rewritten in terms of after-tax real interest rate, $(1-\tau)i-\pi^e$, and the expected real rate of appreciation of the capital asset, $\pi_c^e - \pi^e$, where π^e is the expected inflation rate such that;

$$u_c = p_c\left[\{(1-\tau)i-\pi^e\}-\{\pi_c^e-\pi^e\}+\delta\right] \quad (2)$$

Several factors are important in determining the effects of monetary policy operating through these direct, user-cost channels. The first regards the horizon over which interest rates influence spending. Because capital assets are long-lived and the adjustment of these stocks involves costs (of planning, procurement, installation, etc.), businesses and households take the long view when factoring variation in interest rates into their investment decisions. As a result, the real interest rate and the expected real appreciation of the capital asset that influence spending will typically be related to the expected life of the asset, which is often very long.

The investment decisions of firms and households can also be considered in the framework of James Tobin (1969). For business investment, Tobin (1969) defined *q* as the market value of firms divided by the replacement cost of capital. When *q* is high, the market price of firms is high relative to the replacement cost of capital, and new plant and equipment capital is cheap relative to the market value of firms. Companies can then issue stock and get a high price for it relative to the cost of the facilities and equipment they are buying. As a result, investment spending will rise, because firms can buy a lot of new investment goods with only a small issue of stock. In principle, similar reasoning could be applied to household investment decisions.

Consumption-Based Channels: Wealth Effects

Standard applications of the life-cycle hypothesis of saving and consumption, first developed by Brumberg and Modigliani (1954) and later augmented by Ando and Modigliani (1963), indicate that consumption spending is determined by the lifetime resources of consumers, which includes wealth, whether from stock, real estate or other assets. Expansionary monetary policy in the form of lower short-term interest rates will stimulate the demand for assets such as common stocks and housing, thereby driving up their prices; alternatively (and equivalently), lower interest rates lower the discount rate applied to the income and service flows associated with stocks, homes, and other assets, driving up their price. The resulting increase in total wealth will then stimulate household consumption and aggregate demand. Standard lifecycle wealth effects operating through asset prices are thus an important element in the monetary transmission mechanism.

Intertemporal Substitution Effects

A second consumption-based channel reflects intertemporal substitution effects. Indeed, this channel is central to the models in the DSGE tradition mentioned earlier. In this channel, changes in short-term interest rates alter the slope of the consumption profile, so that lower interest rates induce higher consumption today. In DSGE models, this channel naturally arises through the models' use of the standard consumption Euler equation linking the marginal rate of substitution between current and future consumption with the real interest rate.

The Monetarist and Transmission of Monetary Policy

- The traditional textbook (Keynesian) channel is known as the interest rate or the intertemporal substitution channel:

$$(M \uparrow \Rightarrow)\ i \downarrow \Rightarrow C \uparrow (1 \uparrow) \Rightarrow Y^{d} \uparrow \Rightarrow y \uparrow \Rightarrow \Pi \uparrow \qquad (3)$$

- Expanding 'money' (M) reduces interest rates (i), reduces the cost of borrowing for firms (and consumers), leads to increased consumption (C) as well as investment (I) and therefore higher demand (Y^d), a bigger output gap (y) and finally higher prices and inflation (π)

The interest rate channel and policy responses

- But Bernanke and Gertler (1989) pointed out that the macroeconomic response to policy-induced interest rate changes was considerably larger than implied by conventional estimates of interest elasticity's of consumption and investment. This suggests that mechanisms other than the interest rate channel may also be at work in the transmission of monetary policy.

Credit Transmission Mechanisms

The traditional transmission model rules out the existence of the financial sector and every profitable project at the prevailing interest rate is undertaken as stated by Modigliani and Miller (1958) the source of financing does not matter for the firm to make its (investment) decisions. Resources are always allocated efficiently. In a context of asymmetrical information and no transaction costs, financial intermediation serves no purpose and thus no resources are devoted to it. Nonetheless, financial intermediaries particularly banks exist as the economy's efficient response to information asymmetries between lenders and borrowers, its associated transaction and monitoring costs, and the presence of liquidity risks. Because financial intermediaries exist in a world with multiple financial instruments, at least two sources of financing must be recognized for firms. First, external or intermediated funds, where the firm accesses the financial market, but does not trade directly with individual investors, receiving their funds through an intermediary (bank loans). The second source are internal/direct funds, in which the firm either finances itself, without accessing the financial market, or is able to raise fund directly from individual investors (through the issue of bonds or stocks). For instance, an expansionary monetary policy that increases bank reserves and bank deposits increase the quantity of bank loans available. Where many borrowers are dependent on bank loans to finance their activities, this increase in bank loans will cause a rise in investment (and also consumer) spending, leading ultimately to an increase in aggregate output, (Y). The schematic presentation of the resulting monetary policy effects is given by the following:

$$M \uparrow \rightarrow \text{Bank deposits} \uparrow \rightarrow \text{Bank loans} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow \qquad (4)$$

(Note: M= indicates an expansionary monetary policy leading to an increase in bank deposits and bank loans, thereby raising the level of aggregate investment spending, I, and aggregate demand and output, Y,). In this context, the crucial response of banks to monetary policy is their lending response and not their role as deposit creators. The two key conditions necessary for a lending channel to operate are: (a) banks cannot shield their loan portfolios from changes in monetary policy; and (b) borrowers cannot fully insulate their real spending from changes in the availability of bank credit. The importance of the credit channel depends on the extent to which banks rely on deposit financing and adjust their loan supply schedules following changes in bank

reserves; and also the relative importance of bank loans to borrowers. Consequently, monetary policy will have a greater effect on expenditure by smaller firms that are more dependent on bank loans, than on large firms that can access the credit market directly through stock and bond markets (and not necessarily through the banks).

Exchange Rate Transmission Mechanisms Channel

This channel is a particular case of the assets channel, since it is the price of a particular financial asset, namely another country's currency. However, because of its widespread impact as one the economy's most important relative prices, and its direct effect on inflation through the prices of tradable goods, it is worth treating it as a separate channel. If the exchange rate is not fixed, its behavior should depend on the behavior of the domestic interest relative to the foreign rate. The exact impact of a change in the policy rate is uncertain, because it depends again on the expectations on the interest rates and on domestic and foreign inflation. However, ceteris paribus, an unexpected increase in the domestic interest rate appreciates the local currency on impact. The exchange rate must move to a level where investors expect a sufficiently large future depreciation so that the expected returns of domestic and foreign deposits become equal. The result is an instant appreciation of the exchange rate. The greater value of the local currency increases the price of the country's goods in terms of foreign assets, thereby causing a drop in net exports and in aggregate demand. In addition, the exchange rate directly affects inflation through imported goods.

A contractionary monetary policy, leading to a currency appreciation, will reduce the imported component of inflation. The opposite process, the devaluation of the currency with an expansionary effect on exports and the overall level of activity, has been termed "competitive depreciation and has been traditionally advocated as a quick adjustment mechanism that prevents within a context of price stickiness a big rise in unemployment when facing an adverse shock. In practice, however, the uncovered interest parity, that underlies the expected relationship between domestic interest rate movements and exchange rate depreciation, has received scarce empirical support. The short-run behavior of the exchange rate appears to be extremely volatile, and expectations regarding its movements are closely related to the expected evolution of inflation.

International-Trade Based Exchange Rate Channel

The exchange rate channel: net exports

- The exchange-rate channel:

$$i \uparrow \Rightarrow e \downarrow \Rightarrow NX \uparrow \Rightarrow y \uparrow \Rightarrow \Pi \uparrow \quad (5)$$

- Lower interest rates (i) lead to a depreciation of the exchange rate (e), an increase in competitiveness, an improved trade balance (due to higher net exports, NX) and increased demand, a larger output gap and finally higher inflation
- Moreover.

The monetary transmission mechanism

The exchange rate channel: import prices

- The exchange-rate channel:

$$i \downarrow \Rightarrow e \downarrow \Rightarrow P_m \uparrow \Rightarrow \Pi \uparrow \quad (6)$$

Exchange rate (e) depreciation also raises import prices (P_m), which are important determinants of firms' costs and the retail price of many goods and services: this directly affects the price level and (temporarily) inflation

- An appreciation should reduce inflation (with a longer lag if prices are sticky on the downside)

The monetary transmission mechanism

The exchange rate channel: net wealth

- The exchange-rate channel:

$$i \downarrow \Rightarrow e \downarrow \Rightarrow NW \updownarrow \Rightarrow y \updownarrow \Rightarrow \Pi \updownarrow \quad (7)$$

- An exchange rate depreciation increases the relative value of foreign-denominated assets and liabilities and therefore net wealth (NW), affecting demand
- The sign of the effect depends on the make-up of balance sheets

Asset Prices Channels

The macroeconomic implications of asset prices have received a lot of attention from academia, central banks and governments. For example, significant research efforts have been made to understand the roles of equity prices, house prices and other real estate prices in the transmission mechanism of monetary policy and macroeconomic stabilization at large. The concerns about these prices are both about whether monetary policy reinforces asset price inflation or asset prices development encourages less active monetary policy stabilization. As a result macroeconomists have suggested that monetary policy should respond systematically to asset prices and exchange rate developments. It means that changes in asset prices and exchange rates should be considered as part of the reaction function for central banks. Monetary policy expansion (decrease in the repo rate) affects the short-term money market rates and subsequently long term rates. These money market rate adjustments lower investment returns on domestic investment thus causing an outflow of financial capital and exchange rate depreciation. In addition, this expansions change banks and building society lending house prices and equity withdrawal. Asset prices such as stock prices and real estate prices lose their value affecting the economic activity as a whole.

Other asset price effects: investment (Tobin's q)

- The investment channel (Tobin's q):

$$i \downarrow \Rightarrow Pe \uparrow \Rightarrow q \uparrow \Rightarrow 1 \uparrow \Rightarrow y \uparrow \Rightarrow \Pi \uparrow \quad (8)$$

Consider two ways of increasing the size of a firm:

- ✓ buy another firm (and acquire 'old' capital); or
- ✓ invest in new capital

- The ratio of the market value of a firm to the replacement cost of its assets is known as Tobin's q
- Tobin (1969) argued that a firm should invest in new buildings and equipment if the stock market will value the project at more than its cost (that is, if the project's q is greater than 1)
- Increased equity prices (P_e) mean that new investment projects have become relatively cheaper to finance and therefore more attractive

The monetary transmission mechanism

Other asset price effects: consumption

Other asset price effects: consumption

$$i \downarrow \Rightarrow Pe \uparrow \Rightarrow TW \uparrow \Rightarrow C \uparrow \Rightarrow y \uparrow \Rightarrow \Pi \uparrow \quad (8)$$

- The permanent income hypothesis postulates that consumers' spending is related to (total) wealth
- Increased wealth (as a result of higher equity prices, $P_{e,}$ say) if it is perceived to be permanent leads to a (much smaller) increase in (desired) consumption

The monetary transmission mechanism

Other asset price effects: housing wealth

- Other asset price effects: housing wealth

$$i \downarrow \Rightarrow P_h \uparrow \Rightarrow TW \uparrow ? \Rightarrow C \uparrow \Rightarrow y \uparrow \Rightarrow \Pi \uparrow \quad (10)$$

- Increased house prices (rh) are often associated with increased private consumption in the UK/US

✓ Housing wealth represents greater wealth for some (but for the economy as a whole?);

✓ Housing wealth increases available collateral and therefore reduces credit constraints; and

People may be more likely to change house or spend on improvements/consumer durables (in a process called mortgage equity withdrawal) the monetary transmission mechanism (Boivin, Kiley and Mishkin, 2010).

Monetary Transmission Mechanism, Credit Frictions and Macro prudential Regulation

The monetary transmission mechanism describes how policy induced changes in the nominal money stock or the short-term nominal interest rates impact real variables such as aggregate output and employment (Ireland, 2005). Specific channels of monetary transmission operate through the effects that monetary policy has on interest rates, exchange rates, equity and real estate prices, bank lending, and firm balance sheets. Recent research shows how these channels work in the context of dynamic, stochastic general equilibrium models.

Real effects of shifts in bank loan supply

Given that the empirical evidence generally supports the proposition that banks, particularly those that may find it relatively expensive to raise uninsured liabilities, respond to a monetary policy tightening by reducing loans, we turn to the next link in the bank lending channel mechanism. For the reduction in bank loans to have an impact on economic activity, firms must not be able to easily substitute other sources of external finance when bank loan supply is cut back. Gertler and Gilchrist (1994) find, at a somewhat aggregated level, that the investment of an aggregate of small firms is more responsive to changes in monetary policy than is the investment of an aggregate of large firms, a set of firms that presumably is less bank dependent.

Adverse real-side effects of Contractionary Monetary Policy

One important problem with monetary policies that constrains domestic credit is that they may have substantial adverse supply effects (Ndikumana, 2014). The conventional view is that tight monetary policy that results in credit contraction causes private expenditures (especially durable goods and investment) to decline, causing a decline in aggregate demand, which reduces inflation. The decline in credit is also supposed to cause a reduction in the demand for imports, which ameliorates the current account deficit and reduces (imported) inflation. If credit contraction had only aggregate demand effects, then central banks could indeed control inflation

by using contractionary monetary policy. However, availability of credit determines the ability of firms to accumulate capital and hire labor. Thus, credit contraction causes a decline in capacity utilization, employment, and production. Tight monetary policy, which is usually associated with high interest rates and a strong currency, particularly hurts export-oriented sectors by undermining international competitiveness. The decline in production and exports causes upward pressure on the price level and deteriorates the current account, causing inflation to accelerate. The increase in the price level results in a decline in real credit, which causes investment and employment to decline further. If these supply effects are significant, contractionary monetary policy will fail to reduce and contain inflation

Bank Credit and domestic investment

There is a large and well established literature on the determinants of investment and methodologies for empirical investigation of investment behavior. A selected list includes Baddeley (2003), Chirinko (1993), Jorgenson (1971), Junankar (1973), and Nickell (1978). Fazzari et al. (1988) provide theoretical motivation and empirical evidence on the importance of credit constraints for investment at the firm level. This study focuses on the implications of the links between monetary policy and bank credit for investment at the aggregate level. Empirical results derive a testable relationship between investment and monetary policy to illustrate the effects of monetary policy on domestic investment through bank credit to the private sector. This relationship goes beyond the standard situations of credit rationing (Stiglitz and Weiss, 1981) and financial repression typically examined in the development finance literature (McKinnon, 1973). The monetary policy stance can be explicitly pro- or anti-domestic credit, which affects private investment. In addition to the usual interest rate effect, monetary policy affects investment through the quantity of credit and its overall effects on financial intermediation. By reducing overall financial intermediation, credit contraction depresses business investment and overall economic activity.

Theories of Investment

John M. Keynes and Irving Fisher, both argued that investments are made until the present value of expected future revenues, at the margin, is equal to the opportunity cost of capital. This means that investments are made until the net present value is equal to zero (Eklund, 2013). An investment is expected to generate a stream of future cash flows C (t). Since investment I, represents an outlay at time O, this can be expressed as a negative cash flow, - C_0. The net present value can then be written as:

$$NPV = -C_0 + \int_0^{\infty} C(t)e^{g-r)t}dt \qquad (11)$$

As long as the expected return on investment, i, is above the opportunity cost of capital, r, investment will be worthwhile. When r = i the NPV = 0. The return on investment, i, is equivalent to Keynes' marginal efficiency of capital and Fisher's internal rate of return. From equation (1) the PV of an investment, I, can be written as $C_1/(r - g)$, implying that PV/I = 1.

Keynes and Fisher modern investment theories have emerged, incorporating various aspects of Keynes and Fisher. The net present value rule for investment has become a standard component of corporate finance. Jorhenson (1983) neoclassical theory of investment basically formalizes ideas put forward by Fisher, Keynes' work on subjective probabilities foreshadowed modern probabilistic approaches, such as Keynes has also influenced the so-called accelerator theory of investment, known for its applications to business cycles by Samuelsson (1992). Clearly, Keynes

also inspired Tobin and Brainard in their development of Tobin's Q (Brainard and Tobin, 1968) to incorporate expectations. The methodology to measure marginal q developed by Mueller and Reardon (1993) also belongs to this line of thought.

NEOCLASSICAL THEORY OF INVESTMENT

The relationship between the neoclassical theory, accelerator principle and Tobin's Q theory of investment, all three theories assume optimization behavior on behalf of the decision maker (investor). The neoclassical and Tobin's theory of investment explicitly assumes profit/value maximization. The accelerator theory of investment assumes this implicitly, by assuming that investment is determined by an optimal capital stock, assuming that the production function can be written as a conventional Cobb-Douglas function.

$$Y(t)\ f\left(K(t),L(t)\right)=AK^{\alpha}\ L^{1-\alpha} \tag{12}$$

Where Y(t) is firm output, K is capital and L denotes labour, all in period t. The profit function for a representative firm can then be expressed as follows:

$$\pi(t) = p(t)Y(t) - s(t)I(t) - w(t)L(t) \tag{13}$$

$\pi(t)$ denotes profit, p (t) is the price of output, s (t) is the price of capital and w (t) is the wage. Assuming profit maximization, the current value of a firm, V(0), can be written as:

$$V(0)=\max\ E_{\phi_0}\ \int_0^{\infty}\pi(t)e^{-rt}\ dt =$$

$$E_{\phi_0}\ \left[p(t)Y(t)-s(t)I(t)-w(t)L(t)\right]e^{-rt}\ dt \tag{14}$$

$$s.t..\ dK/dt = I(t) - \delta K(t) - K(t)$$

and K(0) is given.

The term E is an expectations operator conditional on the information set, Φ, available for the firm in each period. To avoid clutter and simplify, the time notations are dropped from now on.

To maximize V (0) the first step is to set up a Lagrangian.

$$L = V(0) + \int_0^{\infty}\lambda\left[\left(I - \delta K\right)\ K\ \right]e^{-rt}\ dt \tag{15}$$

which gives:

$$L=\int_0^{\infty}\left[\left(pY - sI - wL + \lambda\ (I - \delta K) - \lambda K\ \right]e^{-rt}\ dt\right. \tag{16}$$

From this we obtain the familiar current value Hamiltonian.

$$H = pf\ (K,L) - sI - wL + \lambda\ (I - \delta K) \tag{17}$$

Where the Lagrangian multiplier λ(t) is our costate variable, it should be noted that λ (t) represents the shadow price of capital. Differentiating the Hamiltonian, obtaining the following first order conditions:

$$\frac{\partial H}{\partial I} = -s + \lambda = 0 \tag{18}$$

This condition holds that the opportunity cost of capital shall be equal to the shadow price of capital.

$$\frac{\partial H}{\partial I} = sp_L^i - w = 0 \tag{19}$$

This condition simply says that the labour should be employed until the marginal revenue of labour equates with the wage. Recalling the maximum principle (Intriligator, 1971) we get:

$$\frac{\partial H}{\partial \lambda} = \frac{\partial K}{\partial t} = I - \delta K = 0 \quad (20)$$

Which says that in equilibrium, net investment should be zero and gross investment equal to the depreciation of K. finally, the marginal condition for capital is:

$$\frac{\partial H}{\partial K} = pf_K^i - \lambda\delta = 0 \quad (21)$$

The canonical equation (Intrilligator, 1971) requires that $\dot{y} = -\partial K / \partial K$, where y is the control variable such that $y = \lambda e^{-rt}$ at time t. Thus:

$$-\frac{\partial H}{\partial I} = \frac{d}{dt}\left[e^{-rt}\ \lambda(t)\right] = \frac{\partial \lambda}{\partial t} - r\lambda \quad (22)$$

This means that equation (11) can be written as:

$$-pf_K^i + \lambda\delta = \frac{\partial \lambda}{\partial t} - r\lambda \quad (23)$$

From equation (23) we know that s = λ, which implies that $\partial s / \partial t = \partial \lambda / \partial t$. This also means that $\partial H / \partial K$ can be stated in the following way:

$$pf_K^i + s\delta = \frac{\partial s}{\partial t} - rs \quad (14)$$

Rearranging this we obtain:

$$pf_K^i = s\left[\delta + r - \left(\partial s / \partial t\right)/ s\right] \quad (25)$$

Since $-pf_K^i$ is the marginal rate of return on capital, mrr_k, equation (25) can be rewritten as the marginal product of capital:

$$f_K^1 s\left[\delta + -\left(\partial s / \partial t\right)/ s\right]p \quad (26)$$

Note that $f_K^i = \partial Y / \partial K$. Johanson's (1963) user cost of capital, c is defined as: $s\left[\delta + r - (\partial s / \partial t)/ s\right]$, which means that:

$$pf_K^i = c \quad (27)$$

This can now be used to derive the optimal capital stock, K^*, and the investment function. Using Cobb-Douglas technology the marginal product of capital becomes:

$$\frac{\partial \lambda}{\partial K} = \frac{\alpha Y}{K} \quad (29)$$

Multiplying by p, and recalling equation (27) we get:

$$\frac{\partial H}{\partial K} = p\ \frac{\alpha Y}{K} = c \quad (30)$$

Solving for k we obtain an expression for the optimal capital stock:

$$K^* = \frac{p\alpha Y}{c} \quad (31)$$

It is now easy to see that K^* depends on output, price of output and the user cost of capital, c. thus, investment becomes the change in capital between two periods:

$$I\ \frac{p\alpha Y}{c} - K^*\ (t - \tau) \quad (32)$$

Note, that this assumes that K (t) adjust instantaneously and fully to K^* (t). Assuming that the adjustment to the optimal capital stock is only partial each period this can be incorporated into equation (32) by introducing an adjustment parameter that depends on the difference between actual and desired capital, Mueller (2003). Since the neoclassical theory assumes that the capital adjusts immediately and completely to the desired capital stock the investment function is essentially eliminated. It has therefore been suggested that Jorgenson's theory is in fact a capital theory and not an investment theory.

ACCELERATOR THEORY

The accelerator approach is often association with a Keynesian approach which is primarily due to its assumption of fixed prices. The acceleration principle was however first suggested by Clark (1917) and is well known for its applications by Samuelsson (1939) to business cycles. The accelerator is, in fact, merely a special case of the neoclassical theory of investment where the price variables have been reduced to constants. If the price of output is assumed to be constant and the price variables s and r is Jorgenson's (1963) user cost of capital $\left(c=s\left[\delta+r-(\partial s/\partial t)/s\right]\right)$ are fixed, equation 31 reduces to following:

$$K^* = \alpha Y \tag{33}$$

This is simply the well-known accelerator principle where the desired capital stock is assumed to be proportional to output. Investment in any period will therefore depend on the growth in output:

$$I = \alpha \dot{Y} \tag{34}$$

Given flexible prices and partial adjustment toward the desired capital stock each period investment depends on prices of output and input and interest rates (cost of capital). Vernon Smith (1961) demonstrates what he calls the "logical inseparability" of "marginal efficiency" and the "accelerator" determinant of investment expenditures". Smith (1961) used calculus of variation to derive his results. Again, this version of the accelerator assumes a complete and instantaneous adjustment of the capital stock. An alternative is the so-called flexible accelerator that includes lags in the capital stock. Eisher and Strotz (1963) suggest that these lags are because the unit price of capital, s (t), increases with the adjustment speed, (Lucas, 1967).

Q-THEORY OF INVESTMENT

There are two fundamental problems with both the accelerator theory and the neoclassical theory of investment. First by implication, both theories hold that $K_t^* = K_t$ in each period meaning that the adjustment of the capital stock, to its desired level, is instantaneous and complete each period.

Adding an adjustment cost function to the profit function, the firm value (equation 14) can be written as:

$$V(0) = \max\ E_{\Phi_0} \int_0^{\infty} \pi(t) e^{-rt}\ dt$$

$$= E_{\Phi_0} \int_0^{\infty} p\left[(t)Y(t) - s(t)I(t) - \vartheta(I(t))s(t)I(t) - wL(t)\right]e^{-rt}\,dt \tag{35}$$

Where $\vartheta(I(t))$ the marginal adjustment is cost function, Setting up the Hamiltonian and differentiating yield the same marginal conditions for K, L and λ before. Mutatis mutandis, the current value Hamiltonian is written as:

$$H = pf\ (K, L) - sl - \vartheta(I)\,sI - wL + \lambda(I - \delta K) \quad (36)$$

As can be easily seen the marginal conditions are all the same as under neoclassical theory with the exception for investment. This condition now reflects the adjustment cost:

$$\frac{\partial H}{\partial I} = -s - \vartheta(I)\,s - \vartheta'(I)\,sI + \lambda = 0) \quad (37)$$

This can be written:

$$\lambda = s\left[\vartheta(I) + \vartheta'(I)\,I + 1)\right] \quad (38)$$

Since λ is the shadow price of capital and s is the cost of one additional unit of capital the quotient λ/s is, in other words, the marginal return on capital relative to the cost of capital. Therefore dividing by s and defining marginal q as $q_m = \lambda/s$, equation (37) can be written as:

$$q_m = \vartheta(I) + \vartheta'(I)\,I + 1) \quad (39)$$

This allows us to define investment as an implicit function of q_m:

$$I = \varphi(q_m) \quad (40)$$

Differentiating with respect to capital and investment yields a differential equations system. Solving for the optimal capital stock will give the same optimum as under neoclassical theory of investment. The difference is that investment is determined as the optimal adjusted path to the optimal capital stock. In short, the Q-theory incorporates all the assumption of the neoclassical theory of investments but puts a restriction on the speed of capital stock adjustment by adding an adjustment cost function. Solving for the optimal capital stock under Q-theory of investment will yield the same optimal capital stock as the neoclassical. More interestingly, investment is worthwhile as long as λ/s = q_m = 1 there are no more profitable investment opportunities and $K_t = K_t^*$.

Note, the q_m should be interpreted as the marginal return on capital relative to the opportunity cost of capital. Marginal q, in other words, measures the return on investment relative to the opportunity cost of capital, the quotient λ/s is a marginal version of Tobin's Q. typically, Tobin's Q is measured as the market-to-book ration, this, however, translates to a measure of the average return on capital, which is different from λ/s = q_m. Hayashi (1982) demonstrates that average Q will be equal to marginal q only under very restrictive assumption; the firm must be a price taker and the production and installment functions must be homogenous. The methods to measure marginal q and average Q are disused in the next section.

Empirical Review

In an open economy like Nigeria, monetary policy has a transmission channel to output and prices through the exchange rate. This transmission mechanism is accommodated within the portfolio and expectations channel theory. Under a floating exchange rate regime, wealth portfolios include both domestic and foreign assets. When the supply of money increases, a portfolio adjustment takes place, resulting in a higher demand for foreign assets, which will depreciate the exchange rate of the domestic currency and hence the value of the domestic assets.

Again, additional real effects of a policy-induced increase in the short-term interest rate come about when the domestic nominal interest rate rises above its foreign counterparts, equilibrium in the foreign exchange market requires that the domestic currency gradually depreciates at a rate that, again, serves to equate the risk-adjusted returns on various debt instruments, in this case, of markets for financial assets and durable goods (Tobias and Mambo, 2012).

The Keynesian and Monetarists views on interest rates dominate the debate on whether changes in interest rates have an impact on investment. One school avers that it has minimal impact on investment while the other school suggests that changes in interest rates have a significant effect on investment. Smith (1996) offers another significant viewpoint when she avers that the real interest rate is the price at which the supply of and demand for capital are equated where capital is supplied via saving, and is demanded for investment. The Keynesian school believes that interest rate is primarily a monetary phenomenon that is determined by the supply of and demand for money. Among this school, changes in interest rates have minimal impact on investment. Therefore the demand for investment funds is interest inelastic. They envision that increased money supply lowers the interest rate, stimulating investment, employment and hence gross domestic product, that leads to multiple rounds of increased spending and increased real income.

The Monetarists view is that interest rates are a function of the real economy determined by the supply and demand for loanable funds, a market which reflects actual opportunities and constraints in the investment sector. A change in the interest rates therefore causes far-reaching effects on investment. In this case the demand for investment finance is interest elastic. The monetary school sees changes in money supply as stimulating new and old investment on real and financial assets, consumption goods as well as investment goods. Interest rates affect investment decisions, the critical ones in Kenya being the Central Bank Rate, Savings or deposit rate, Lending rate and the 91 day Treasury Bill Rate. Changes in interest rates are also seen to affect the prices of assets such as bonds whilst long-term interest rates are particularly important in the mortgage sector.

The traditional Keynesian interest rate channel, a policy-induced increase in the short-term nominal interest rate leads first to an increase in long-term nominal interest rates, as investors act to arbitrage away differences in risk adjusted expected returns on debt instruments of various maturities. When nominal prices are slow to adjust, movements in nominal interest rates translate into movements in real interest rates, firms, finding that their real cost of borrowing over all horizons has increased, cut back on their investment expenditures; likewise households, facing higher real borrowing costs, scale back on their purchases of homes, automobiles, and other durable goods. Thus, aggregate output and employment falls (Tobias and Mambo, 2012).

Yamori (1995) using instrumental variable technique from the period 1975-1988; Delke (1996) reported results consistent with the hypothesis of Feldstein-Horioka for Japanese data. Similarly, Palley (1996) tested the causal relationship between saving and investment over the sample period 1973:4-1995:2 using Granger causality test for United State. The results showed that investment has a negative effect on personal saving and independent of government saving. Also, personal saving negatively affects government saving, thereby concurring with the Keynesian paradox of thrift thereby disputing F-H puzzle.

Ozmen and Parmaksiz (2003) used Johansen cointegration technique and Engle and Granger two-step residual-based approach to cointegration to test for the Feldstein-Horioka puzzle for UK economy in the period 1948-1998. The authors concluded that there exist a long run relationship between saving and investment, thereby lending support to the Feldstein-Horioka puzzle.

Payne (2005) employed Engle-Granger and error correction model (ECM) to study the relationship between saving and investment in Mexico over the period 1960-2002. The results showed that savings and investment are cointegrated, thereby indicating low capital mobility in accordance with F-H hypothesis. However, the coefficient of error correction model is positive and statistically significant with a binding intertemporal budget constraint and an adjustment parameter of 0.242.

Narayan (2005) studied the relationship between investment and saving for the period 1960-1999 by applying Autoregressive Distributed Lag (ARDL) Model and Granger causality test for Japan. The author found long run relationship between saving and investment which suggest that there must be granger causality in at least one direction. Therefore, the Granger causality test results suggest bidirectional causality relationship between saving and investment. Thus, lending support to Feldstein and Horioka (1980) hypothesis.

Singh (2008) examined the long run relationship between saving and investment to determine the degree of capital mobility using Two-step Residual-based test, Autoregressive Distributed Lag (ARDL) Model and Granger causality test from the period 1950-51 to 2001-02. The results revealed long run relationship between saving and investment in India, supporting the Feldstein-Horioka hypothesis.

Mishra et al. (2010) studied the dynamic relationship between savings and investment in India for the period 1950-51 to 2008-09 by employing Johansen cointegration technique and Granger causality test via Vector Autoregressive framework. The authors found the presence of long run equilibrium relationship between saving and investment in India. The Granger causality test revealed directional causal relationship between the variables under study.

Seth (2011) applied Engle-Granger and Error Correction Model (ECM) to investigate the long run relationship between saving and investment for India from the period 1980-2008. The results showed long run relationship between savings and investment. The results also revealed long run equilibrium relationship between corporate savings and corporate investment. The former supports low capital mobility into India, whereas the latter revealed that corporate sectors dependency on their fund for investment.

Tang and Lean (2008) applied Rolling Windows Bounds test to empirically investigate the relationship between savings and investment over the period 1960-2007 for Malaysia. The study showed that savings and investment are not cointegrated implying that capital is internationally mobile over the same period.

Shahbaz et al. (2010) analyzed savings and investment correlation through the application of Autoregressive Distributed Lag (ARDL) bounds testing for cointegration through Error Correction Model (ECM) for Pakistan from period1976-2006. The authors reported long run

relationship among savings, domestic investment, inflation, real exchange rate, and financial development which invariably indicate inadequate capital mobility in the country.

Adebola and Dahalan (2012) investigated the relationship between savings and investment nexus for Tunisia from the period 1970-2009 by employing Autoregressive Distributed Lag (ARDL) Model and Granger causality test. The authors found the existence of long run relationship when investment is taken as dependent variable. The results of Granger causality test revealed two-way relationship justifying the low capital mobility as suggested by FH hypothesis. Empirical studies also emerged from a panel of OECD countries.

Krol (1996) examined the relationship between saving and investment using data for 21 OECD countries covering the period 1962-1990 by employing fixed effects estimates. The results reject the idea that capital is highly mobile internationally.

Jansen (1996) re-examined the relationship between savings and investment for 23 OECD countries spanning the period 1951-1991 using Error Correction Model (ECM). The author revealed evidence of cointegration between saving and investment which invariably indicating an in capital mobility within the OECD. Another study by Hussein (1998) for 23 OECD countries over the period 1960-1993 to test the Feldstein-Horioka hypothesis by applying Dynamic Ordinary Least Square (DOLS). The results revealed that international capital mobility in 18 out 23 is very low, while the results suggest a moderate change in Canada, Denmark, Finland, Greece and Sweden.

Kasuga (2004) investigated the relationship between savings-investment nexus for 23 OECD and 79 non-OECD countries spanning 1980-1995. The author employed Ordinary Least Square (OLS) and instrumental variables. The results revealed that if domestic saving increases net worth, it increases domestic investment. Therefore, the study suggests that the impact of domestic saving depends on financial system and their development.

Pelgrin and Schich (2008) applied a panel Error Correction Model (ECM) to analyze the long run relationship distinctly from the short run adjustment via the Autoregressive Distributed Lag (ARDL) Model in addition to Dynamic Fixed-Effects Estimator (DFE), Pooled Mean Group (PMG) estimator and Mean Group Estimator (MGE) for 20 OECD countries from 1960-1999. The authors found that saving and investment have long run cointegration relationship that is consistent with the interpretation that a long run solvency constraint is binding for each country.

Raoet al. (2010) applied the Bludell and Bound systems GMM method and Structural Breaks tests of Mancini-Griffoli and Pauwels to test the Feldstein-Horioka from the period 1960-2007 for a panel of 13 OECD countries. The results evidenced that the Feldstein-Horioka hypothesis is valid in the pre-Bretton Woods period and international capital mobility was negligible even though there has been a significant improvement in international capital mobility in the OECD countries. Last but not least, another group of studies examine if the puzzle also holds in country groups other than the OECD countries.

Mamingi (1997) tested the savings and investment correlation by employing Ordinary Least Squares and Fully Modified Least Squares for 58 developing countries over the period 1970 -

1990. The author revealed that many developing countries are financially integrated in the long run. The results further showed that saving and investment correlation for low-income countries is higher than those for middle-income countries, using Japan and 10 other Asian countries data by employing Johansen framework covering the period 1950-1999.

Sinha (2002) revealed long run relationship between savings and investment for Myanmar and Thailand. The study also showed that the growth of the saving rates granger causes the growth rate of investment rates for Malaysia, Singapore, Sri Lanka and Thailand. However, causality runs from investment rates to saving rate for Hong-Kong, Malaysia, Myanmar and Singapore.

Chakrabarti (2006) re-examined the relationship between saving and investment by employing Multivariate Heterogeneous panel cointegration for the panel of 126 countries spanning 1960-2000. The author found a significant positive association between the ratio of gross domestic investment to GDP and the ratio of gross domestic saving to GDP ranging from 0.58 to 0.81. The evidence of cointegration and a significant positive correlation between saving and investment may indicate a low degree of financial integration in the world capital markets, which is the basis for the FH hypothesis.

Telataret al., (2007) studied the relationship between savings and investment for 10 European countries over the period 1970-2002 by applying a Markov-Switching Model which allowed data to be drawn from two different states-high capital mobility and low capital mobility-and extent it to allow variances to change among different regimes. The authors found a low correlation between savings and investment for Belgium, Denmark, Finland, France, Italy and Sweden. While, no single switching point in the regime of capital mobility measuring the degree of correlation between national savings and national investment was reported for the remaining countries.

Kim et al. (2007) applied Generalized Least Square (GSL) estimation by iterating the Seemingly Unrelated Regression (SUR) system using the newly computed covariance and system equation estimates for Big three (China, Malaysia, and Korea), ASEAN countries and Greater China (Hong Kong, Taiwan, and China) covering the period 1980-2002. The authors concluded that the saving-investment correlation in East Asia steadily decreases over time but is still higher than that of the OECD countries.
Ketenci (2012) used Gregory and Hansen and Johansen approach to cointegration to measure long run relationship between savings and investment for 23 EU countries for the period 1995-2009. The author showed that there is evidence of cointegration in all cases except for Estonia and Portugal. The low level saving-retention coefficient estimated in the presence of structural breaks revealed high capital mobility in most of the countries under study disputing the Feldstein-Horioka hypothesis

Dixit and Pindyck (1994) suggested that increased uncertainty caused by exchange rate variations reduces investment given the irreversibility of investment projects and, hence, increases the value option of delaying expenditures. Jayaraman (1996) in his cross-country study on the macroeconomic environment and private investment in six Pacific Island countries observed a statistically significant negative relationship between the variability in the real exchange rate and private investment.

Thomas (1997) in his study of 86 developing countries examined data on terms of trade, real exchange rates, and property rights and concluded that while factors including credit availability and the quality of physical and human infrastructure are important influences, uncertainty in the foreign exchange rate was negatively related to private investment in sub-Saharan countries.

Gómez (2000) in a study titled exchange rate volatility effects on domestic investment in Spain argue that there is no unique expected exchange rate effect on investment, its sign and importance remaining as a mainly empirical question.

Bakare (2011) carried out an empirical analysis of the consequences of the foreign exchange rate reforms on the performances of private domestic investment in Nigeria adopting the ordinary least square multiple regression analytical method. The multiple regression results showed a significant but negative relationship between floating foreign exchange rate and private domestic investment in Nigeria. The findings and conclusion of the study support the need for the government to dump the floating exchange regime and adopt purchasing power parity which has been considered by researchers to be more appropriate in determining realistic exchange rate for naira and contribute positively to macroeconomic performances in Nigeria.

Kanagaraj and Ekta (2011) examined the level of foreign exchange exposure and its determinants in Indian firms and it was found that only 16 percent of the firms had exchange rate exposure at 10 percent level of significance. About 86 percent of the firms are negatively affected by an appreciation of the rupee which confirms that Indian firms are net exporters. On the determinants of exchange rate exposure, the study reveals that export ratio is positively and hedging activity is negatively related to the exchange rate exposure of pure exporter firms.

Nazar and Bashiri (2012) investigates the relationship between real exchange rate uncertainty and private investment in Iran for the period of 1988 to 2008 by using quarterly data and applying bivariate generalized autoregressive conditional heteroskedasticity (Bivariate GARCH) model in the Iranian economy. The study reveal that real exchange rate uncertainty significantly influences private investment and has a negative effect on it and that private investment uncertainty affects the level of private investment, negatively.

Lucky and Kingsley (2016) examined factors that determine Nigerian capital formation. The objective was to test Jhingan's propositions for sources of capital formation in Nigeria. Time series data were sourced from Central Bank of Nigeria (CBN) Statistical Bulletin. Nigerian Gross Fixed Capital Formation (GFCG/GDP) was modeled as the function of Broad Supply (M2/GDP), Credit to Private Sector (CPS/GDP), Gross National Savings (GNS/GDP), Commercial Banks Lending Rate, Exchange Rate (EXR), Inflation Rate (INFR), External Debt (EXTD/GDP), Public Expenditure (PEX/GDP), Government Revenue (GR/GDP), Terms of trade (TT/GDP) and Operating Surplus (OPS/GDP). Cointegration Test, Augmented Dickey Fuller Unit Root Test, Granger Causality Test and Vector Error Correction Model were used to test the dynamic relationship between the variables. Findings proved that M2/GDP, GNS/GDP, EXR, EXTD/GDP, TT/GDP have negative and insignificant effect on capital formation while CPS/GDP, LR, INFR, PEX/GDP, GR/GDP and OPS/GDP have positive and insignificant effect. The model summary revealed 86.0% explained variation and f-statistics 12.38458 probability of

0.000004. The study concludes that the variables have significant impact on Nigerian Gross Fixed Capital Formation and confirm the Jhingan's proposition.

Adelowokan Adesoye & Balogun (2015) examines the effect of exchange rate volatility on investment and growth in Nigeria over the period of 1986 to 2014. The vector error correction method, impulse responses function, co-integration and Augmented Dickey Fuller (ADF) test for stationarity were employed to capture the interactions between the variables. The results confirm the existence of long run relationship between exchange rate, investment, interest rate, inflation and growth. Finally the results show that exchange rate volatility has a negative effect with investment and growth while exchange rate volatility has a positive relationship with inflation and interest rate in Nigeria.

Chowdhry and Wheeler (2008) in an empirical analysis studied the relationship between volatility of exchange rate for the four developed countries of Canada, Japan, United State and United Kingdom. Using a number of variables this study applied vector auto regressive (VAR) approach and found that shocks to exchange rate volatility have positive and significant impact on flow of FDI.

Akeju (2014) examined the impact of real exchange rate on terms of trade and economic growth which relies on cointegration techniques and error correction model using annual data covering from 1980-2012. It was revealed that a real exchange rate moves along the same direction with terms of trade in the long run.

Rasaq (2013) examined the impact of exchange rate volatility on the macro economic variables in Nigeria and findings shows that exchange rate volatility has a positive influence on GDP, FDI and trade openness with a negative influence on the inflationary rate in the country.

Ndikumana (2014) searched the implications of monetary policy for domestic investment through its impacts on bank lending to the private sector and interest rates in sub-Saharan African countries, the study based on a sample of 37 sub-Saharan African countries over 1980-2012, the study found that monetary policy affects domestic investment negatively indirectly through the bank lending or quantity channel, as well as directly through the interest rate or cost of capital channel.

Zulkefly Abdul Karim (2010) searched the impacts of monetary policy on institutions' investment in Malaysia, the study used dynamic neoclassical framework in an autoregressive distributed lagged (ARDL) mode, the study showed the impact of monetary policy on institutions' investment spending, the study also reveal that the impact of monetary policy channels to the institutions' investment are heterogeneous, therefore the small institutions that faced financial constraint responded more to monetary tightening as compared to the large institution.

Tobias and Mambo (2012) searched the impacts of monetary policy on private sector investment in Kenya during (1996-2009) by tracing the impacts of monetary policy through the transmission mechanism to explain how investment responded to changes in monetary policy, they founded that government domestic debt and Treasury bill rate are inversely related to

private sector investment, while money supply and domestic savings have positive relationship with private sector investment consistent with the ISLAM model.

Literature Gap

The empirical literature presented above gives details of the dynamic relationship between monetary policy variables specially interest rate and exchange rate on real investment. None of the studies examined focused on the Nigeria environment and the studies failed to integrate other monetary policy instruments or other channels of monetary policy.

SECTION III: RESEARCH METHODOLOGY

This study intend to examine the impact of monetary policy transmission mechanism on domestic real investment in Nigeria from 1981 – 2015. The relevant data were sourced from Central Bank of Nigerian Statistical Bulletin. Time series data were used and econometric method of data analyses which involves Ordinary Least Square (OLS) were employed. The multiple regressions formulated in this study are based on the various schools of thought on the effect of monetary policy on investment.

DINVT= f(CPS/GDP, EXR, MLR, MPR,PLR,NDC, SR,TBR) …… (41)

Transforming equation 1 above to econometric method, we have:

$DINVT= \beta_0 + \beta_1 CPS/GDP + \beta_2 EXR + \beta_3 MLR + \beta_4 MPR + \beta_5 PLR + \beta_6 NDC + \beta_7 SR + \beta_8 TBR + \mu$ …… (42)

Where:

DINVT= Domestic real investment proxy Gross Fixed Capital Formation to Gross Domestic Product

CPS/GDP	=	Credit to private sector of the economy proxy for credit channel
EXR	=	Naira exchange rate per US Dollar proxy for exchange rate channel
MLR	=	Maximum lending rate proxy for interest rate channel
MPR	=	Monetary policy rate proxy for interest rate channel
PLR	=	Prime lending rate proxy for interest rate channel
NDC	=	Net domestic credit proxy for credit channel
SR	=	Savings rate proxy for interest rate channel
TBR	=	Treasury bill rate proxy for asset price channel
μ	=	Error Term
$\beta_1 - \beta_8$	=	Coefficient of Independent Variables to the Dependent Variable
β_0	=	Regression Intercept.

ESTIMATION TECHNIQUES

i. Stationarity Test:

Time series data are assumed to be non-stationary and this implies that the result obtained from Ordinary Least Square (OLS) may be misleading (Suleman and Azeeze, 2012). It is therefore necessary to test the stationarity of the variables using the Augmented Dickey Fuller 1979 test to both level and first difference. The ADF

test constructs a parameter correction for higher order correlation by assuming the times series follows an auto regressive process. Mathematically expressed as

$$\Delta y_t = c + \beta_t + \alpha y_{t-1} + \sum_{t-i}^{k} \gamma_j \Delta y_{t-j} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 43$$

$$\Delta y_t = c + \alpha y_{t-1} + \sum_{t-i}^{k} \gamma_j \Delta y_{t-j} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 44$$

Equation 1 is used to test for the null hypotheses of non stationarity of unit root against trend stationaerity alternative in Y_t where y refers to the examined time series. Equation 2 tests the null hypotheses of a unit root against a mean stationarity alternative.

ii. Johansen Cointegration Test

The cointegration test established whether a long run equilibrium relationship exist among the variables. It is generally accepted that to establish a cointegration, the likelihood ratio must be greater than the Mackinnon critical values. The model can be stated as

$$\Delta X_t = \mu + \Psi_1 \Delta X_{t-1} + \Psi_2 \Delta X_{t2} + \ldots + \Psi_{p-1} \Delta X_t - p + 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 45$$

Where μ is a constant term.

ΔX_t Represents the first cointegrating differences

iii. Granger Causality

To determine the direction of causality between the variables, the study employed the standard Granger causality test (Granger, 1969). The test is based on Vector Error Correction Model (VECM) which suggests that while the past can cause or predict the future, the future cannot predict or cause the past. Thus, according to Granger (1969) X Granger cause Y if past value of X can be used to the past value of Y, the test is based on the following regression model.

$$DIVNT_1 = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} NDC_{t-j} + \sum_{j=1}^{k} \beta_{2j} CPS/GDP_{1-j} + \sum_{j=1}^{k} \lambda_{2j} MLR_{t-j} + \sum_{j=1}^{k} \theta_{2j} PLR + \sum_{j=1}^{k} \delta_{2j} MPR_{t-j} + \sum_{j=1}^{k} 7_{2j} SR + \sum_{j=1}^{k} 8_{2j} EXR + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (46)$$

$$NDC_1 = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} DIVNT_{t-j} + \sum_{j=1}^{k} \beta_{2j} CPS/GDP_{1-j} + \sum_{j=1}^{k} \lambda_{2j} MLR_{t-j} + \sum_{j=1}^{k} \theta_{2j} PLR + \sum_{j=1}^{k} \delta_{2j} MPR_{t-j} + \sum_{j=1}^{k} 7_{2j} SR + \sum_{j=1}^{k} 8_{2j} EXR + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (47)$$

$$CPS/GDP_1 = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} NDC_{t-j} + \sum_{j=1}^{k} \beta_{2j} DIVNT_{1-j} + \sum_{j=1}^{k} \lambda_{2j} MLR_{t-j} + \sum_{j=1}^{k} \theta_{2j} PLR + \sum_{j=1}^{k} \delta_{2j} MPR_{t-j} + \sum_{j=1}^{k} 7_{2j} SR + \sum_{j=1}^{k} 8_{2j} EXR + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (48)$$

$$MLR_1 = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} CPS/GDP_{t-j} + \sum_{j=1}^{k} \beta_{2j} NDC_{1-j} + \sum_{j=1}^{k} \lambda_{2j} DIVNT_{t-j} + \sum_{j=1}^{k} \theta_{2j} PLR + \sum_{j=1}^{k} \delta_{2j} MPR_{t-j} + \sum_{j=1}^{k} 7_{2j} SR + \sum_{j=1}^{k} 8_{2j} EXR + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (49)$$

$$PLR_1 = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} MLR_{t-j} + \sum_{j=1}^{k} \beta_{2j} CPS/GDP_{1-j} + \sum_{j=1}^{k} \lambda_{2j} NDC_{t-j} + \sum_{j=1}^{k} \theta_{2j} DIVNT + \sum_{j=1}^{k} \delta_{2j} MPR_{t-j} + \sum_{j=1}^{k} 7_{2j} SR + \sum_{j=1}^{k} 8_{2j} EXR + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (50)$$

$$MPR_1 = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} PLR_{t-j} + \sum_{j=1}^{k} \beta_{2j} MLR_{1-j} + \sum_{j=1}^{k} \lambda_{2j} CPS/GDP_{t-j} + \sum_{j=1}^{k} \theta_{2j} NDC + \sum_{j=1}^{k} \delta_{2j} DIVNT_{t-j} + \sum_{j=1}^{k} 7_{2j} SR + \sum_{j=1}^{k} 8_{2j} EXR + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (51)$$

$$SR_1 = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} MPR_{t-j} + \sum_{j=1}^{k} \beta_{2j} PLR_{1-j} + \sum_{j=1}^{k} \lambda_{2j} MLR_{t-j} + \sum_{j=1}^{k} \theta_{2j} CPS/GDP + \sum_{j=1}^{k} \delta_{2j} NDC_{t-j} + \sum_{j=1}^{k} 7_{2j} DIVNT + \sum_{j=1}^{k} 8_{2j} EXR + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (52)$$

$$EXR = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} SR_{t-j} + \sum_{j=1}^{k} \beta_{2j} MPR_{1-j} + \sum_{j=1}^{k} \lambda_{2j} PLR_{t-j} + \sum_{j=1}^{k} \theta_{2j} MLR + \sum_{j=1}^{k} \delta_{2j} CPS/GDP_{t-j} + \sum_{j=1}^{k} 7_{2j} NDC + \sum_{j=1}^{k} 8_{2j} DIVNT + \sum_{j=1}^{k} 9_{2j} TBR + \mu \ldots\ldots (53)$$

$$TBR = \alpha_{2t} + \sum_{j=1}^{k} \phi_{2j} EXR_{t-j} + \sum_{j=1}^{k} \beta_{2j} SR_{1-j} + \sum_{j=1}^{k} \lambda_{2j} MPR_{t-j} + \sum_{j=1}^{k} \theta_{2j} PLR + \sum_{j=1}^{k} \delta_{2j} MLR_{t-j} + \sum_{j=1}^{k} 7_{2j} CPS/GDP + \sum_{j=1}^{k} 8_{2j} NDC + \sum_{j=1}^{k} 9_{2j} DIVNT + \mu \ldots\ldots (54)$$

iv. Vector Error Correction Model

Co-integration is a prerequisite for the error correction mechanism. Since co-integration has been established, it is pertinent to proceed to the error correction model. The VECM is of this form:

$$\Delta y_t = \alpha\beta y_{t-1} + \sum_{i=1}^{j=1} \Gamma_j \Delta y_{t-1} + \pi + \varsigma_t, t = 1,....,T \quad \text{.....55}$$

Where Y_t is a vector of indigenous variables in the model. α is the parameter which measures the speed of adjustment through which the variables adjust to the long run values and the β is the vectors which estimates the long run cointegrating relationship among the variables in the model. π is the draft parameter and is the matrix of the parameters associated with the exogenous variables and the stochastic error term.

SECTION IV: RESULTS AND DISCUSSION

The following tables reveal the short and long-run relationship between the dependent and the independent variables as formulated in the regression models.

Table l: Static Regression Results

VARIABLE	COEFFICIENT	STD ERRS.	T-STATISTICS	PROB.
CPS_GDP	0.216214	0.053536	4.038692	0.0005
EXR	-0.011483	0.011980	-0.958490	0.3482
MLR	0.010294	0.119165	0.086383	0.9319
MPR	0.099263	0.131979	0.752112	0.4600
PLR	-0.032967	0.063517	-0.519019	0.6089
NDC	0.010353	0.004031	2.568253	0.0175
SR	0.092961	0.129165	0.719707	0.4793
TBR	-0.079370	0.109866	-0.722421	0.4776
β_0	4.185199	1.767476	2.367896	0.0271
R-squared	0.899448			
Adjusted R-quare	0.653793			
F-statistic	14.11552			
Prob(F-statistic)	0.000057			
Durbin-Watson stat	1.587986			

Source: E-VIEW 9.0

An examination of the OLS regression estimate shows that the effects of monetary policy transmission mechanism on domestic real investment in Nigeria. As presented in the table above the R^2 0.899(89.9%) while adjustment R^2 0.653 showing a total of 65.3% of the variations in domestic real in can be explained by the changes in the explanatory variables, while the remaining 10.1% and 35.7% can be traced to variables not capture in the model. The large explained variation justified the important of monetary policy transmission mechanisms in determining domestic real investment. However, with respect to the signs the parameters estimates, the variables indicates that EXR, PLR and TBR have negative relationship with

domestic investment in Nigeria while CPS/GDP, MLR,MPR, NDC and SR have positive relationship with the dependent variable. Furthermore, the overall fit of regression model is good given an F-statistic of 14.11552 (P-value = 0.000057). However, the Durbin Watson statistic is found to d* = 1.587986 and does not lies between D-Watson critical values of dL 1.50; du = 1.84 and suggesting test inconclusive in the level series result. This indicates that there may be some degree of time dependence in the level series result which could lead to spurious regression results, suggesting the need for more rigorous analysis of the stationarity properties of the level series Data.

Table II: STATIONARITY TEST: FIRST DIFFERENCE

VARIABLE	ADF STATISTICS	MACKINNON			PROB.	ORDER OF INTR.
		1%	5%	10%		
DIVNT	-6.653843	-3.670170	-2.963972	-2.621007	0.0000	1(1)
NDC	-9.276781	-3.679322	-2.967767	-2.622989	0.0000	1(1)
CPS/GDP	-5.726112	-3.661661	-2.960411	-2.619160	0.0000	1(1)
MLR	-6.388511	-3.661661	-2.960411	-2.619160	0.0000	1(1)
PLR	-6.136048	-3.679322	-2.967767	-2.622989	0.0000	1(1)
MPR	-6.745340	-3.679322	-2.967767	-2.622989	0.0000	1(1)
SR	-9.807361	-3.670170	-2.963972	-2.621007	0.0000	1(1)
EXR	-6.006947	-3.653730	-2.957110	-2.617434	0.0000	1(1)
TBR	-7.885135	-3.670170	-2.963972	-2.621007	0.0000	1(1)

Source: Extract from E-view (9.0)

From the table above, the results of the unit root tests show that the null hypotheses of a unit root for time-dependent variables of a non-stationary nature can be made stationary at the first difference. It also shows that all the variables in the model are integrated of order 1(1).This implies that the variables became stationary at first differencing and it is integrated of 1(1). From the above we conclude that null hypothesis is rejected and the alternate accepted, having established the order of integration for the variables, the next step is to carry out a co-integration test to determine whether a long-run relationship exists between the variables. In this study we adopt co-integration test developed by Johansen (1988).

Table III: TEST OF COINTEGRATION: MAXIMUM EIGEN

Hypothesized No. of CE(s)	Eigen Value	Maximum Eigen	0.05 Critical Value	Prob.**	Decision
None *	0.989796	132.9637	58.43354	0.0000	Reject H0
At most 1 *	0.978547	111.4148	52.36261	0.0000	Reject H0
At most 2 *	0.929926	77.08781	46.23142	0.0000	RejectH0
At most 3 *	0.840761	53.28318	40.07757	0.0010	Reject H0
At most 4*	0.650348	30.47368	23.87687	0.0009	Reject H0
At most 5	0.583289	25.38550	27.58434	0.0931	Accept H0
At most 6	0.290095	9.936100	21.13162	0.7507	Accept H0
At most 7	0.224601	7.376952	14.26460	0.4456	Accept H0
At most 8	0.001710	0.049639	3.841466	0.8237	Accept H0

Source: Extract from E-view (9.0)

From Table iii above, the results of the Johansen co-integration test shows that we adopt the alternative hypotheses of at most 4 co-integrating equation at the 5% level of significance. This implies that, there are four linear combinations of the variables that are stationary in the long run and also confirms the existence of a long-run relationship between monetary policy transmission mechanism and domestic real investment in Nigeria.

Table IV: NORMALIZED COINTEGRATING EQUATION

VARIABLE	COEFFICIENT	STD. ERR	REMARK
DIVNT	1.000000		
CPS_GDP	1.201171	0.03099	Confirm to expectation
EXR	0.113576	0.00720	Confirm to expectation
MLR	2.137430	0.07541	Confirm to expectation
MPR	-1.462463	0.08907	Contrary to expectation
PLR	-0.031775	0.00286	Contrary to expectation
NDC	-0.970289	0.04506	Contrary to expectation
TBR	1.080615	0.07097	Confirm to expectation
SR	2.769803	0.03468	Confirm to expectation

Source: Extract from E-view (9.0)

The cointegration test presented in table iii fails to establish the nature of long run relationship that exist between the dependent and the independent variables. The normalized co-integration test above established the nature of long-run relationship that exists among the variables. From the table CPS/GDP, EXR, MLR, TBR and SR have positive long run relationship with Nigeria domestic real investment which confirm to the expectation of the results while MPR, PLR and NDC have negative relationship with real domestic investment in Nigeria which is contrary to expectation. The negative effect of the variables can be traced to monetary policy shocks such as the withdrawal of all public funds from commercial banks which contract commercial banks lending behavior, the deregulation of interest rate in the last quarter of 1986 and the various financial sector regulations imposed by the regulatory authorities.

Table V: GRANGER CAUSALITY		**F-STAT**	**P-VALUE**	**REMARK**	**DECISION**
CPS_GDP does not Granger Cause DIVNT	32	0.60232	0.5547	Not Sig	Accept H0
DIVNT does not Granger Cause CPS_GDP		4.53660	0.0008	Sig.	**Reject H0**
EXR does not Granger Cause DIVNT	32	4.15763	0.0049	Sig	Reject H0
DIVNT does not Granger Cause EXR		0.47260	0.6284	Not Sig	Accept H0
MLR does not Granger Cause DIVNT	32	1.51538	0.2378	Not Sig	Accept H0
DIVNT does not Granger Cause MLR		5.37506	0.0000	Sig	Reject H0
MPR does not Granger Cause DIVNT	32	3.90916	0.0148	Sig	Reject H0
DIVNT does not Granger Cause MPR		4.02306	0.0230	Sig	Reject H0
NDC does not Granger Cause DIVNT	29	5.28765	0.0003	Sig	Reject H0
DIVNT does not Granger Cause NDC		0.34719	0.7102	Not Sig	Accept H0
PLR does not Granger Cause DIVNT	32	0.06006	0.9418	Not Sig	Accept H0

DIVNT does not Granger Cause PLR		1.50603	0.2398	Not Sig	Accept H0
SR does not Granger Cause DIVNT	32	0.07113	0.9315	Not Sig	Accept H0
DIVNT does not Granger Cause SR		0.32077	0.7283	Not Sig	Accept H0
TBR does not Granger Cause DIVNT	32	0.77685	0.4699	Not Sig	Accept H0
DIVNT does not Granger Cause TBR		0.52736	0.5961	Not Sig	Accept H0

Source: Extract from E-view (9.0)

Pair wise causality tests were run on the regression models formulated with an optimal lag of 2. The results are presented in Table V. The researcher's interest here is to establish the direction of causality between the dependent variables the domestic real investment and monetary policy transmission mechanism. As shown in the table some of the variables have causal relationship that lead to the rejection of null hypotheses(MLR,MPR,DIVT,EXR) while others have no causal relationship that make us accept null hypotheses(NDC,PLR,SR,TBR).

Table VI: OVER PARAMATIZED ERROR CORRECTION MODEL

VARIABLE	COEFFICIENT	STD ERRS.	T-STATISTICS	PROB.
C	3.936155	2.087834	1.885282	0.0740
CPS_GDP	0.211992	0.055278	3.835039	0.0010
EXR	-0.012147	0.012881	-0.942984	0.3569
MPR	0.075050	0.137622	0.545335	0.5916
NDC	0.010521	0.004139	2.541763	0.0194
PLR	-0.023035	0.071420	-0.322532	0.7504
MLR	0.038627	0.125893	0.306820	0.7622
SR	0.088961	0.135165	0.658166	0.5179
TBR	-0.088704	0.113542	-0.781244	0.4438
ECM(-1)	0.612161	0.228050	4.930330	0.0033
R2	0.614325			
ADJ. R2	0.440772			
F-STATISTICS	3.539687			
F-PROB	0.008888			
D.W	1.951119			

Source: Extract from E-view (9.0)

Given that, a long–run equilibrium relationship has been established. Therefore, we estimate the error correction term using the vector error correction model to examine their speed and magnitude at which the long-run equilibrium corrects for disequilibrium. To further the analysis of the long run relationship, monetary policy transmission mechanism and domestic real investment under investigation is then specified in a VECM incorporating a two – period lag residual. The VECM is employed to capture the short-run deviations of the parameters from the long-run equilibrium. The autoregressive distributed lag techniques were used with a maximum lag of 1 to obtain an over parameterized result and then arriving at the parsimonious error correction result using the general to specific approach.From the Table above, the vector error correction model (VECM) result shows that R^2 = 61% and adjusted R^2 =44% % which indicates a good fit with an F- statistic value of 3.539687 and a probability value of 0.008888 and the error

correction term. This is further analyzed by a Parsimonious. ECM is appropriately signed and statistically significant with a probability value of 0.0033.

Table VII: PARSIMONIOUS ERROR CORRECTION MODEL

VARIABLE	COEFFICIENT	STD ERRS.	T-STATISTICS	PROB.
C	-0.045591	0.358199	-0.127279	0.9000
D(DIVNT(-1))	0.016848	0.180955	0.093108	0.9267
D(EXR(-1))	-0.001635	0.028839	-0.056682	0.9554
D(MPR(-1))	0.134997	0.201203	0.670948	0.5099
D(PLR(-1))	-0.043733	0.103350	-0.423156	0.6767
D(PLR(-2))	0.017651	0.099461	0.177470	0.8609
D(MLR(-1))	-0.030144	0.161488	-0.186665	0.8538
D(SR(-1))	-0.160121	0.198025	-0.808589	0.4283
D(SR(-2))	0.092143	0.178568	0.516007	0.6115
ECM(-1)	-0.810669	0.314591	-2.576900	0.0180
R2	0.363127			
ADJ. R2	0.076534			
F-STATISTICS	1.267048			
F-PROB	0.312918			
D.W	1.862664			

Source: Extract from E-view (9.0)

The parsimonious error correction result indicates a good fit with an F-ratio of 5.405437, an R^2 of 56% and an adjusted R^2 of 36% meaning that the model explains approximately 56% of the variations in domestic real investment; the D-Watson statistic of 1.862664 suggests absence of any autocorrelation. The error correction term of -0.810669,has the appropriate negative sign is significant and shows that approximately 81% of the deviation from long run equilibrium on domestic real investment in the model is corrected every year (since it is estimated annually). Evidence from the above table shows that some of the variables that are not significant and were dropped from the model. The variables such as CPS/GDP, NDC and TBR are statistically not significant, an examination of CBN statistical bulletin reveal that CPS/GDP fluctuates very high within the period covered in this study. The insignificant effect of the variables can be traced monetary and macroeconomic shocks in the monetary policy channel.

SECTION V: CONCLUSION AND RECOMMENDATIONS

The objective of this study is to establish the dynamic relationship that exists between monetary policy transmission mechanism and domestic real investment in Nigeria. From the static regression result, the study found that CPS/GDP, MLR, MPR, NDC and SR have positive relationship with real domestic investment in Nigeria while EXR, PLR and TBR have negative relationship with the dependent variable. the positive effect of the independent variables confirm the findings of Ozmen and Parmaksiz (2003) whose study concluded that there exist a long run relationship between saving and investment, thereby lending support to the Feldstein-Horioka puzzle, Payne (2005) whose results showed that savings and investment are cointegrated, thereby indicating low capital mobility in accordance with F-H hypothesis and the positive coefficient of error correction model, Mishra et al. (2010) whose study found the presence of

long run equilibrium relationship between saving and investment and the Granger causality test revealed directional causal relationship between the variables under study.

The negative relationship between exchange rate and domestic real investment confirm the findings of Bakare (2011) which results showed a significant but negative relationship between floating foreign exchange rate and private domestic investment in Nigeria, Nazar and Bashiri (2012) whose study reveal that real exchange rate uncertainty significantly influences private investment and has a negative effect on private investment, Adelowokan Adesoye & Balogun (2015) results confirm the existence of long run relationship between exchange rate, investment, interest rate, inflation and growth. The results show that exchange rate volatility has a negative effect with investment, Ndikumana (2014) who that found that monetary policy affects domestic investment negatively indirectly through the bank lending or quantity channel, as well as directly through the interest rate or cost of capital channel.

From the regression summary, the study concludes that monetary policy transmission mechanism has causal and significant relationship with domestic real investment in Nigeria. We therefore make the following recommendations:

(i) Interest rate management and reactions to domestic real investment must be factored into the management and formulation of monetary policy in Nigeria and institutional and policy barriers to investment should be removed.

(ii) An elimination of the barriers to effective transmission of monetary policy transmission mechanisms is good start to encourage investment in the real sector of the economy and there is need to define the interest rate structure to encourage investment borrowings.

(iii) Expansionary monetary policy should be formulated that will reduce interest rate, encourage borrowings and savings. This will expand commercial banks and other credit granting financial institutions which will encourage real investment in the economy.

(iv) One common method of the regulatory authorities to encourage investment borrowing is through good investment environment which is lacking in the country which is lacking in the country. One way to correct this is the formulation of investment and macroeconomic policies that encourage investment borrowings.

(v) The Central Bank of Nigeria needs to target the exchange rate for now as one of its main control variables to influence national economic indices and May later adopt the control of inflation as a medium term measure. The control of interest rate or monetary policy rates (MPR) to influence domestic investment activities may be adopted in the long run.

(vi) The financial market is characterized with various policies and the operating environment of the financial market can affect the operational efficiency and the impact of monetary policy on target variables therefore there is need to revisit some of the policies to correspond with the modern financial system innovation that will enhance the free flow of investment into the Nigeria economy.

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